

## **CHAPTER 5**

### **PREVENTION AND CONTROL OF WORKPLACE HAZARDS**

#### **0501. Discussion**

Section 19(a) of the Occupational Safety and Health Act (OSHAct) requires government activities to provide all Federal employees with a safe and healthful place of employment. To fulfill this requirement, the Chief of Naval Operations (CNO) directs each level of command to establish and maintain an effective hazard control program. The first method to be followed in hazard control is preventing hazards through the design process of systems, equipment and facilities. The command designing the equipment, systems or facilities is responsible for design safety.

To minimize hazards in the workplace, commands shall identify hazardous conditions through workplace inspections (discussed in chapter 9), employee hazard reports (discussed in chapter 10), and industrial hygiene survey reports (discussed in chapter 8). They shall promptly eliminate or control all identified safety and health hazards, subject to priorities based upon the degree of risk posed by the hazards. The preferred method of hazard abatement is through application of engineering controls or substitution of less hazardous processes or materials. The next preferred method is the use of administrative controls, possibly in conjunction with personal protective equipment (PPE). Total reliance on PPE is acceptable only when all other methods are proven to be technically and/or economically infeasible. This chapter discusses the basic principles of hazard control and assigns responsibility for implementing hazard abatement actions.

#### **0502. Principles of Hazard Control**

Safety professionals and industrial hygienists are specialists with training and experience in recognition, evaluation and control of workplace hazards. They shall be thoroughly familiar with potential hazards created by various materials, equipment and operations used in Navy facilities. They shall also be aware of special designs required by Navy Occupational Safety and Health (NAVOSH) standards to mitigate certain hazards. The following sections discuss some of the principles applied to prevent or mitigate workplace hazards.

a. Substitution. Activities may reduce the risk of injury or illness by replacement of an existing (or intended) process, material or equipment with a similar item having more limited hazard potential.

(1) Examples of process substitutions may include:

(a) Brush painting instead of spray painting to reduce inhalation hazards

(b) Welding instead of riveting to reduce noise levels.

(2) Equipment changes may include:

(a) Use of electric motors rather than internal combustion engines for indoor operation to eliminate potential carbon monoxide exposures

(b) Use of safety cans in place of bottles to store flammable solvents, presenting less of a fire hazard.

(3) Examples of material substitution include:

(a) Switching from methylene chloride to citrus-based formulas for paint stripping to reduce risk of injury to the liver and kidneys of exposed workers

(b) Replacing sand with synthetic abrasives in abrasive blasting cabinets to minimize the silicosis hazard associated with exposure to free silica dust.

Activities shall exercise care in any substitution to ensure that the substitute materials are technically acceptable and they avoid introducing a new or unforeseen hazard.

b. Isolation. Activities may control hazards by using isolation. Isolation is the placing of an appropriate barrier or limiter between the hazard and an individual who may be affected by the hazard. Isolation includes using physical barriers, time separation or distance. Examples include machine guards, electrical insulation, acoustical containment, semi-automatic equipment that does not require constant attendance (time separation) and remote controlled equipment.

c. Ventilation. Activities may control potentially hazardous airborne substances by ventilation, using one of two methods:

(1) Diluting the concentration of the substance by mixing it with uncontaminated air

(2) Removing the substance at its source or point of generation.

The first of these methods is termed general ventilation or dilution ventilation; the second is called local exhaust ventilation. Local exhaust ventilation is generally the preferred and more economical method of hazard control. Properly used, however, general ventilation can be very effective for the removal of large volumes of heated air or for the removal of low concentrations of low toxicity contaminants from minor and decentralized sources. Activities shall design, operate and maintain ventilation systems per the principles outlined in references 5-1 through 5-4.

d. Administrative Control. Activities may also control hazards administratively. This method of hazard mitigation depends on effective operating practices that reduce the exposure of individuals to chemical or physical hazards. These practices may take the form of limited access to high hazard areas, preventive maintenance programs to reduce the potential for leakage of hazardous substances or adjusted work schedules that involve a regimen of work in high hazard and low hazard areas. As an administrative control, adjusted work schedules are appropriate only when an activity recognizes the hazard has an occupational exposure limit below which nearly all workers may experience repeated exposure without adverse effects. The amount by which the 8-hour time weighted average-occupational exposure limit may be exceeded for short periods without injury to health depends on a number of factors such as the nature of the contaminant, whether or not the effects are cumulative, the frequency with which high concentrations occur and the duration of such periods. Activities shall take all factors into consideration in determining whether a hazardous condition exists and whether or not excursions from the limit are permitted.

**NOTE:**

Exposure limits, such as permissible exposure limits (PELs) established by the Occupational Safety and Health Administration (OSHA), or Threshold Limit Values (TLVs) established by the American Conference of Governmental Industrial Hygienists (ACGIH) are intended for use in the practice of industrial hygiene and are to be interpreted and applied only by a person trained in this discipline.

e. Personal Protective Equipment (PPE). Activities may also control hazards by using PPE. This method of hazard control is least preferred because personal protective devices may reduce a worker's productivity. In addition, it is the only method of control that does not reduce levels of contaminants in the workplace. Nevertheless, there are instances where adequate levels of risk reduction cannot be achieved through other methods and personal protective devices must be used, either alone or in conjunction with other protective measures. Specific PPE and situations where it may be used are described throughout this manual.

**0503. Application of Hazard Control Principles**

a. Occupational Safety and Health in the Acquisition Process. Reference 5-5 requires that Program Managers (PM) for Major Defense Acquisition Programs develop a programmatic environment, safety and health evaluation at the earliest possible time in the acquisition process. This evaluation describes the PM's strategy for meeting environment, safety, and health requirements during system construction, operation, maintenance, and disposal. PMs responsible for the acquisition of Navy weapons systems, facilities, and support equipment or major modifications to existing weapon systems, facilities or equipment shall perform a safety and health evaluation as described in reference 5-5. This evaluation shall identify and evaluate occupational safety and health hazards, define risk levels, and establish a process that will manage the probability and severity of all hazards associated with the development, use, and disposal of these systems, facilities and equipment. These hazards shall be managed consistent with mission requirements, and management efforts employed shall be cost-effective. The safety and health hazards to be managed include any conditions that create a significant risk of death, injury, acute or chronic illness, disability, and/or reduced job performance of personnel who will produce, test, operate, maintain, or support the system, facility or equipment. Each management decision to accept the risks associated with an identified hazard shall be formally documented.

Navy PMs shall establish a hazardous material control and management program that ensures appropriate considerations are given to eliminating and reducing the use of hazardous materials in construction, maintenance, operation and disposal processes. They shall manage the selection, use, and disposal of hazardous materials to incur the lowest cost required to protect human health and the environment over the system's facility's, or equipment's life-cycle. Where use of a hazardous material cannot be avoided, the PM shall develop and implement plans and procedures for identifying, minimizing use, tracking, storing, handling, and disposing of such materials.

b. Design Reviews. In many instances facility design engineers are not totally familiar with all potential health hazards created by various materials, equipment and operations used in Navy industrial facilities, nor are they aware of the special design considerations required to control these

hazards. To ensure that appropriate hazard control techniques are applied, cognizant industrial hygienists and safety professionals shall participate in a review of plans and specifications for facility projects, including both special projects and military construction projects (see section 0506d. Reviewers shall consider, appropriately influence the design, and engineer safety and occupational health aspects into all facilities that are acquired or constructed for use by Navy employees. Design engineers shall ensure that projects involving potential health hazards, such as toxic materials, radiation, noise, or other health hazards, shall follow established principles of industrial engineering (i.e., references 5-2 through 5-4 and 5-6 through 5-9). Commercial software is available to assist design engineers in the process of identifying safety and health requirements. COMNAVFACENGCOM can provide guidance in obtaining the software.

c. Operating Procedures. Activities shall include appropriate health and safety requirements in standard operating procedures or similar directives that are issued to direct the manner in which work is performed. Originators of instructions that affect productivity shall integrate instructions that affect well being of workers to achieve organization goals in both areas with minimal conflict or confusion. Originators of directives that involve work with potential hazards shall coordinate with cognizant safety and health personnel to ensure that they have considered applicable NAVOSH requirements.

d. Purchasing/Contracting Procedures. Activities can avoid many hazards by incorporating appropriate safety and health hazard control principles and requirements into specifications for purchased equipment/material and contracts that involve work at Navy facilities. Where Navy facilities develop specifications for purchases/ contracts, the activity organizations responsible for purchase requests, contracts and engineering design specifications shall coordinate with cognizant OSH personnel. This will ensure that: NAVOSH requirements are considered in specifications; contractor operations do not compromise the safety and health of Navy personnel or NAVOSH regulatory compliance at the involved Navy facility; and contractor operations are compatible with any concurrent/co-located Navy operations. It also ensures an appropriate exchange of information as required by OSHA regulations for multi-employer worksites.

e. Interim Hazard Abatement Measures. Activities shall use immediate, temporary hazard abatement measures during the time needed to design and implement permanent hazard control measures. Where engineering controls are not immediately applicable, administrative controls and/or PPE are appropriate for use as interim hazard abatement measures.

f. Permanent Hazard Abatement. Engineering control methods are the preferred method of hazard control, followed by administrative controls and PPE. Activities shall use feasible engineering controls to reduce hazardous exposure, even when only partial reduction of exposure is possible through engineering methods. They shall apply two criteria to determine whether engineering controls are feasible. First, a control is technologically feasible if it is available off-the-shelf or if technology exists which can be adapted to the hazard in question. Second, a control is economically feasible if it can be shown that the cost of the control is justified by the benefit it produces. On the other hand, if the expected reduction of the hazard through implementation of an engineering control is insignificant in terms of increased protection and the cost of implementing the control is great, then the control is economically infeasible.

**0504. Development of Hazard Control Recommendations**

Activities shall consider the following possible actions when recommendations are developed for prevention or reduction of hazards:

- a. Avoiding, eliminating, or reducing deficiencies by engineering design, material selection or substitution
- b. Isolating hazardous substances, components and operations from other activities, areas, personnel and incompatible materials
- c. Incorporating fail-safe principles to prevent a catastrophic injury to personnel, damage to the equipment, or inadvertent operation of critical equipment
- d. Relocating equipment/components so that personnel access during operation, maintenance, repair or adjustment does not result in exposure to hazards, such as chemical burns, electrical shock, electromagnetic radiation, cutting edges, sharp points or toxic atmospheres
- e. Providing suitable warning and notes of caution concerning required personnel protection during operation, assembly, maintenance and repair instructions
- f. Providing distinctive markings on hazardous components, equipment or facilities
- g. Requiring use of PPE when other controls do not reduce the hazard to an acceptable level
- h. Monitoring exposure to ensure that engineering controls effectively reduce the hazard
- i. Training employees to recognize hazards and take appropriate precautionary measures.

**0505. Occupational Safety and Health Program Self-Assessment and Improvement Plans**

Each headquarters command and all field activities shall perform a comprehensive self-assessment of the command NAVOSH program at least annually following Program Review and Measurement System (PR&MS) Self Assessment Model guidelines contained in appendix 2-B. Based on the results of the assessment, each headquarters command and all field activities shall develop and implement plans of action to address program areas in need of improvement. The activity OSH council, where established, shall review and concur with self-assessments and improvement plans and shall review the progress achieved in implementing improvement actions at least annually. For activities not requiring an OSH council, the commander, commanding officer, or officer in charge shall review and approve the annual self-assessment and improvement plans. For headquarters commands, the designated Safety and Health Official shall review and approve the annual assessment and improvement plans.

a. The activity self assessment shall include, as a minimum, a review of mishap statistics and analysis data, - inspection records, hazard reports and risk assessments, - evaluations of compliance posture and the industrial hygiene exposure assessment reports outlined in chapter 8. Headquarters commands will provide additional guidance as necessary to their subordinate activities on conducting self-assessments of the NAVOSH program. The assessment of headquarters NAVOSH programs shall determine the effectiveness of meeting headquarters NAVOSH program requirements as outlined in chapter 3 section 0303.

b. Activities shall develop specific improvement strategies for each area identified as needing improvement. For each strategy, activities shall define performance or measurement standards and establish target completion dates.

c. CNO requires self-assessment improvement plans for all activities and for each headquarters command (except for exclusively administrative headquarters commands without subordinate activities). Headquarters commands shall submit their plans to CNO (N45) within 45 days of the beginning of the fiscal year.

#### **0506. Responsibilities**

The control of OSH hazards is the inherent responsibility of each command with specific responsibilities to apply controls assigned to the command's supervisory levels. The following are assigned responsibilities for directing and supervising an effective OSH hazard control program.

a. Chief, Bureau of Medicine and Surgery (BUMED) shall:

(1) Assist the Deputy Chief of Naval Operations (DCNO) (Logistics) in carrying out OSH program responsibilities in matters of hazard control.

(2) Determine, validate and establish health criteria and standards.

(3) On a continuing basis, identify equipment, facilities and materials in Navy systems, as well as processes, procedures and work practices, which may adversely affect the health of all Navy employees to ensure health risks are recognized and evaluating corrective measures taken.

(4) Provide technical advice for occupational health education in applicable training curricula and conduct specialized training in occupational health.

(5) Perform research identifying and controlling health hazards related to occupational exposures.

(6) Review and evaluate the effectiveness of occupational health policies and procedures and recommend appropriate actions to the CNO.

(7) Provide occupational health assistance to requesting activities.

(8) Assist in reviewing plans and specifications for facilities construction projects to identify and control potential health hazards as requested.

(9) Assist in reviewing the programmatic ESH evaluation of new systems during the design and operational test and evaluation phases in the acquisition process.

b. Commanders of Headquarters Commands shall:

(1) Assist the DCNO (Logistics) in carrying out program responsibilities in the area of hazard control.

(2) On a continuing basis, identify and evaluate (in coordination with BUMED), safety and health exposure in naval systems, equipment and material affecting the safety and health of Navy employees ashore.

(3) Identify and develop, in coordination with appropriate commands, manpower and material requirements in support of the control of OSH conditions ashore.

(4) Ensure that safety and occupational health problems associated with the development, production and disposal of new equipment and materials are recognized and that provisions are made in the development process for their control.

(5) Ensure that systems safety engineering and management principles are applied during research, development, test, evaluation, production and acquisition of equipment, facilities and material. Ensure that OSH professionals are included in IPPD teams and that comprehensive programmatic ESH evaluations are performed at appropriate phases in the acquisition process.

(6) Provide technical and managerial assistance to subordinate activities on hazard control measures.

(7) Provide subordinate activities with a systematic approach to conduct the annual self-assessment of the NAVOSH program, including desired key measures of effectiveness.

c. Activity Commanders, Commanding Officers and Officers in Charge shall:

(1) Monitor the hazard control program on a continuing basis including engineering, maintenance, management policy and supervisory control to ensure the identification and elimination of hazards.

(2) Apply procedures for OSH control across the design/engineering/installation/operations/maintenance/disposal interface ensuring the integration of a dynamic hazard control program consistent with operational and NAVOSH requirements.

d. Naval Facilities Engineering Command, Engineering Field Divisions and Activities should establish a Facility System Safety Working Group (FSSWG) to review facility designs for new military construction (MILCON) projects ensuring hazards are identified and controlled. The FSSWG should include the procuring activity safety manager, industrial hygienist, environmental engineer, planner, user and Naval Facilities Engineering Command Engineering Field Division (EFD) safety engineer. The FSSWG should provide the EFD with a list of hazardous operations that are of concern and review the control methods that will be used. The EFD Safety Engineer should

coordinate with the working group to determine adequacy of controls. The FSSWG should track hazard and risk resolution, conduct pre-occupancy inspections and assist the EFD construction safety engineer to verify installation of the required controls as stated by the designers.

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### References

- 5-1. DOD Military Standard 882C of 19 January 96, System Safety Program Requirements
- 5-2. DoDI 5000.1, The Acquisition System of 23 Oct 00 and DoD 5000.2-R of 15 Mar 96
- 5-3. Industrial Ventilation, A Manual of Recommended Practice, American Conference of Governmental Industrial Hygienists, Inc., P.O. Box 453, Lansing, MI 48902, (NOTAL)
- 5-4. American National Standards Institute (ANSI), Z9.2-2001, American National Standard for Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems, (NOTAL)
- 5-5. DODI 5000.2-R of 4 Nov 96, Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information System (MAIS) Acquisition Programs (NOTAL)
- 5-6. Military Handbook - Industrial Ventilation Systems, MIL-HDBK-1003-17C (NOTAL)
- 5-7. 29 CFR 1910.16, Occupational Safety and Health, Adoption and extension of Federal Standards, Effective Dates
- 5-8. Compendium of Materials for Noise Control. National Institute for Occupational Safety and Health, Robert A. Taft Laboratories, Cincinnati, OH, May 1980. DHEW (NIOSH) Publication No. 80-116 (NOTAL)
- 5-9. Noise Control, A Guide for Workers and Employers. U.S. Department of Labor, Occupational Safety and Health Administration, Office of Information, 1980 (NOTAL)